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(58) Field of search
UK CL (Edition J) B5N, D1R RAA RABB RABC RABD RDD RDE RFG RFK RFZ
INT CL' B32B, D04H

(54) Non-woven sheet material which includes jute fibres and thermoplastic material

(57) Non-woven sheet material (2) comprising jute fibres and auxiliary material (4) for imparting strength and rigidity to the sheet material, the auxiliary material (4) having been subjected to heat and pressure so that the auxiliary material binds the jute fibres together and forms the sheet material, and the jute fibres being such that they form the major component of the sheet material. The auxiliary material may be polyester bicomponent fibres, polypropylene fibres or a polyvinyl acrylic powder or liquid. A polypropylene fibre layer may be laminated to two corded jute layers by hot calendering. The jute layer may be reinforced by warp stitching (6) and by a weft array secured by the warp stitching.

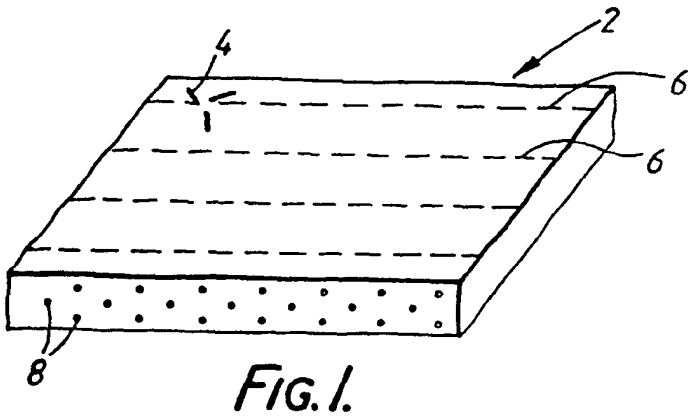

FIG. 1.

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.
The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.

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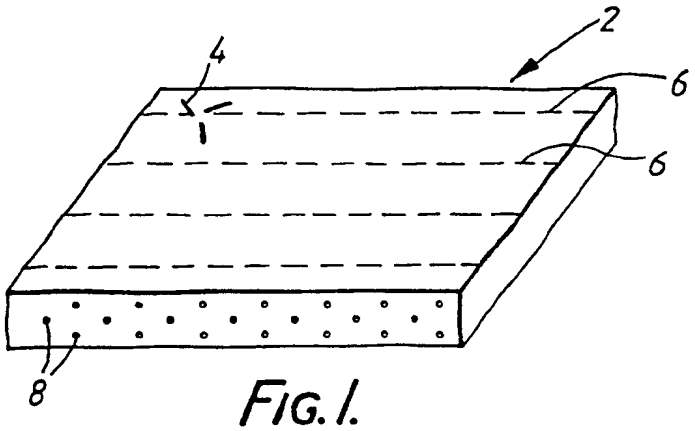

FIG. 1.

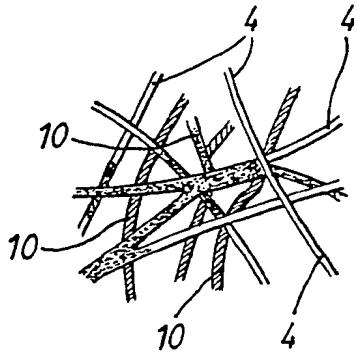

FIG. 2.

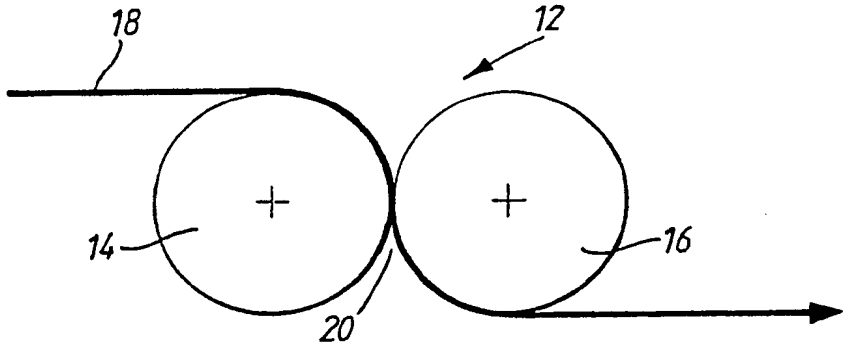

FIG. 3.

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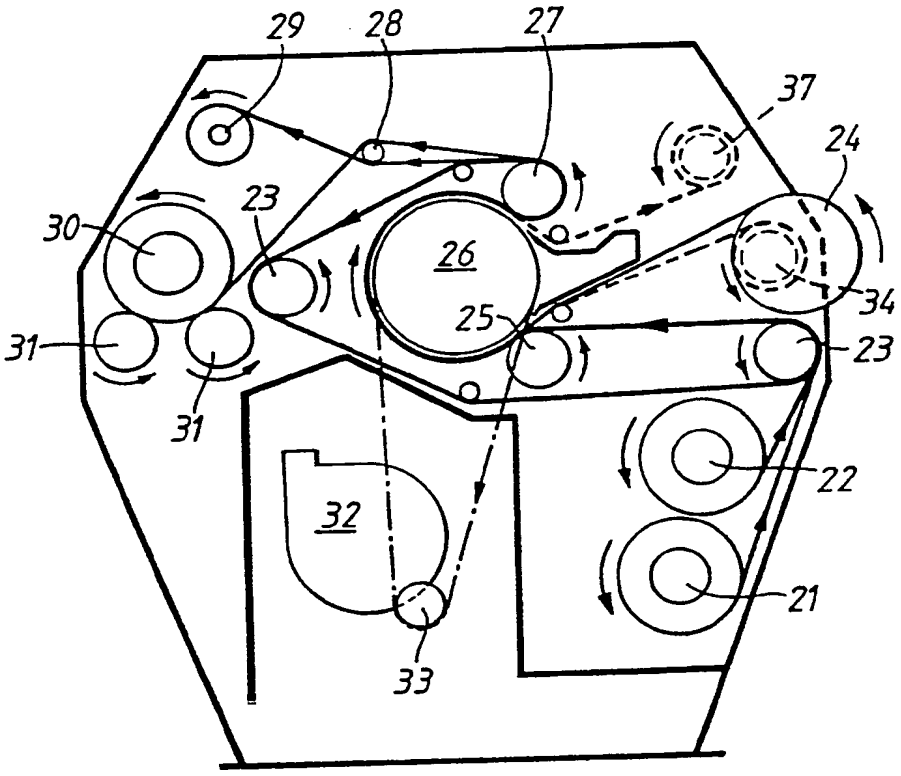

FIG. 4.

NON-WOVEN SHEET MATERIAL WHICH INCLUDES JUTE FIBRES

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This invention relates to non-woven sheet material which includes jute fibres.

Woven sheet material formed of jute yarns is well known. This woven sheet material is produced by spinning jute fibres into yarns and then weaving the yarns into the sheet material. The sheet material is used to form part of a variety of products such for example as roofing felts, linoleum, upholstery, protective blankets and dust sheets. The woven sheet material can be relatively expensive to produce and it is an aim of the present invention to provide a substitute sheet material which can be produced more cheaply.

Accordingly, this invention provides non-woven sheet material comprising jute fibres and auxiliary material for imparting strength and rigidity to the sheet material, the auxiliary material having been subjected to heat and pressure so that the auxiliary material binds the jute fibres together and forms the sheet material, and the jute fibres being such that they form the major component of the sheet material.

The non-woven sheet material of the invention can be more cheaply produced than the above mentioned known woven sheet material. In addition, with the known woven sheet material,

there often occurs the problem of threads being snagged or cut and subsequently running. This problem is obviated with the non-woven sheet material of the present invention.

The auxiliary material may comprise bi-component synthetic fibres which are formed to have a core of a material suitable for imparting strength and rigidity to the sheet material and a sheath of meltable material which melts such that when it is subjected to heat and pressure, it binds the jute fibres together with the coreof material to form the non-woven sheet material. The bi-component synthetic material may include polyester plastics material. The meltable material may be randomly dispersed in the auxiliary material.

Alternatively, the auxiliary material may comprise plastics fibres. Preferably the plastics fibres are polypropylene fibres. Generally, any plastics fibres may be employed that melt at an appropriate temperature, for example under 220°C.

Still further, the auxiliary material may be an adhesive material which has been applied as a powder or as a liquid to the jute fibres. The adhesive material may be, for example, a polyvinyl acrylic material.

The jute fibres may form at least 65% by weight of the non-woven sheet material. Preferably, the jute fibres form from 70-95% by weight of the non-woven sheet material.

The non-woven sheet material is preferably one in which the jute fibres are arranged in an even form by using a plurality of carding systems including a fine carding system, and in which the jute fibres are over laid to achieve a desired thickness and width for the non-woven sheet material. The fine carding system may employ carding apparatus suitable for giving a semi-worsted finish. The over laying is preferably effected by folding a web of the jute fibres back on itself a desired number of times to give a desired weight in grams per square meter.

After the jute fibres and the auxiliary material have been carded and over laid, they are subsequently consolidated under heat and pressure. The amount of pressure employed is variable. Generally, increasing pressures give more solid non-woven sheet material.

The temperatures employed may be from 180°C to 350°C. The actual temperature employed and also the actual pressure employed depend upon the speed of feeding of the formed sheet material through the apparatus supplying the heat and pressure. For example, a temperature of 180°C to 220°C is a preferred

temperature for a feed rate of 5 to 20 meters per minute.

The non-woven sheet material may be provided with reinforcing stitching in the warp direction. This reinforcing stitching will usually be applied prior to the application of the heat and pressure.

The non-woven sheet material may also be provided with reinforcing stitching in the weft direction. Again, this reinforcing stitching will usually be applied prior to the application of heat and pressure.

Advantageously, the non-woven sheet material may be formed such that reinforcing weft threads are laid on the back of a web of the jute fibre, for example at the above mentioned cross laying stage. These weft threads are not in themselves actually in the form of stitches and they are held in position by warp stitched threads. If the weft reinforcing is positioned between one or more layers of the cross laid jute material, then the weft reinforcement becomes hidden between the layers as they overlap.

The non-woven sheet material of the present invention may be used for many of the purposes used by conventional woven jute sheet material. Thus, the non-woven sheet material of the invention may be used as a component in the formation of products such for example as roofing felt, linoleum, upholstery, protective blankets, dust sheets, shoe liner

materials, polyvinyl chloride coated tarpaulins, reinforcing in conveyor belts, insulating materials, sound-proofing materials, asbestos products, as a basis and/or reinforcement for paper and plastics material laminates, underlay, carpet backing, fabrics for bedding and upholstery, filler material for rug and carpet backing, ironing boards, cushion liners and capillary mats.

An embodiment of the invention will now be described solely by way of example and with reference to the accompanying drawings in which:

Figure 1 is an isometric view of a piece of non-woven sheet material of the invention;

Figure 2 shows in enlarged form a small piece of the material shown in Figure 1 and it illustrates how fibres are bonded at intersections;

Figure 3 shows somewhat schematically a heat and pressure applying roller arrangement; and

Figure 4 is a side view through a machine that may be employed to apply the heat and pressure to a mat of jute fibre material.

Referring to Figure 1, there is shown a piece of non-woven sheet material 2 comprising jute fibres and auxiliary sheet material in the form of bi-component plastics fibres 4 sold by Wellman Inc., United States of America, under the

Trade Mark FILLWELL. The jute fibres and the plastics fibres 4 are formed as a composite material due to the application of heat and pressure causing the plastics fibres 4 to melt and bond together the jute fibres, in addition to imparting strength and rigidity to the sheet material 2. The sheet material 2 is provided with lines of stitching 6 to impart further strength to the sheet material 2. The lines of stitching 6 extend in the warp direction and they can be effected with any desired and appropriate type of thread.

The non-woven sheet material 2 is produced by folding of jute material back upon itself and, between the various folds of the jute material, weft threads 8 can be laid. These weft threads 8 are held in position by being sandwiched between the various layers of the jute material and also they are held in position by the warp line of stitching 6.

Figure 2 shows an enlarged part of Figure 1 and it shows particularly how the plastics fibres 4 become bonded together at intersection points under the application of heat and pressure. The darkened parts indicate where bonding has taken place and these darkened parts will also be effective to bond together jute fibres, shown somewhat schematically as jute fibres 10 in Figure 2.

Referring now to Figure 3, there is shown a heat and

pressure arrangement 12 comprising a pair of heated rollers 14, 16. A web of non-woven jute fibres in a finely carded form pass as sheet material 18 through a nip 20 between the rollers 14, 16. The applied heat and pressure in the nip 20 causes the formation of the non-woven sheet material 2 shown in Figure 1.

In order to further illustrate the non-woven sheet material of the present invention, reference will now be made to the following Examples which are given for illustrative purposes only.

EXAMPLE I

Bales of jute were taken and were cut open. The cut open bales of jute were passed to a jute spreader comprising two revolving cylinders with steal pins acting as combs. The jute spreader was effective to spread out the jute from the bales and a chemical emulsion was then applied to the jute to soften the fibres and to make them more handleable. The emulsion was a mineral oil that is emulsifiable in water. Optionally, rot-proofing agents can also be applied to the jute.

Lengths of the jute material were then made into narrow rolls and were left for 48 hours in order to let the emulsion start to soften the jute fibres. A small amount of heat was

generated at this stage.

The rolls were then introduced into a breaker card machine in which the fibres were torn apart with a high speed roller. The fibres were then introduced into a friction card machine which further refined the jute fibres. The refined jute fibres were then passed to a finisher card machine which formed the jute fibres into sheet material. The finisher card machine was of a type known as a semi-worsted synthetic card. The finisher card machine is effective to refine and align the jute fibres, drawing them out into a fine web. The fine web was then over laid in a cross folding machine to give sheet material of the required thickness and weight.

The over laid web was then fed through apparatus of the type shown in Figure 4 in order to apply auxiliary material in the form of polypropylene plastics fibres.

In Figure 4, there is shown dry laminating apparatus comprising a bonding agent roller 21, a first fabric supply roller 22, blanket tensioning and guiding rollers 23, and a second fabric supply roller 24. The apparatus also includes an input pressure roller 25, a Teflon (registered trade mark) coated heated roller 26, an output pressure roller 27, a cooling pipe 28, and a rewind roller 29 for rewinding fabric

under tension. The apparatus also includes a rewinding roller 30 for rewinding the fabric in a relaxed condition, and rewind support rollers 31. In addition, the apparatus has a cooling fan 32 and a main motor 33.

Parts of the apparatus which would not normally be used but which could be employed if desired are a print material supply roller 34, and a print paper out roller 37. Using heat and pressure, the jute fibres and the polypropylene plastics fibres are consolidated together to form composite sheet material using heat and pressure. The rollers were heated to 180°C and the fibres were passed through the rollers at a rate of 15 meters per minute. The formed sheet material was found to be suitable for uses in which woven jute sheet material had previously been used.

EXAMPLE II

A web of finely carded jute fibres was produced as described above in accordance with Example I. This web was modified by stitching it in the warp direction in order to provide reinforcement. The stitching was chain stitching effected on a Malimo chain stitching machine. The produced composite product was found to be strengthened over the product produced in accordance with Example I and was available for use where strength characteristics were of importance, thus outweighing the increased cost of the extra

manufacturing stitching step.

EXAMPLE III

A web of finely carded jute fibres was produced as in Example I except that at the cross laying stage, reinforcing threads of material, for example cotton, were laid in the weft direction between various layers of the over laid jute web. Stitching in the warp direction was then effected as described in Example II. The stitching in the warp direction reinforced the web of material and it also helped to secure the weft reinforcing threads in position. Thereafter the stitched web was mixed with auxiliary reinforcing material, as in Examples I and II, and heat and pressure were then applied to produce non-woven sheet material which had even better strength characteristics than the non-woven sheet material produced in accordance with Example II.

It is to be appreciated that the embodiments of the invention described above with reference to the accompanying drawings and the Examples have been given for illustrative purposes only and that they are not to be read in any limiting sense. Thus, for example, the amount of stitching employed can be varied and it can also extend in the weft direction as opposed to just laying reinforcing material in the weft direction. Furthermore, instead of using polypropylene

plastics fibres or bi-component synthetic fibres, other auxiliary material such as powdered or liquid adhesives can be employed. The non-woven sheet material of the present invention may be as much as from 10-30% cheaper to produce than comparable known woven sheet material formed of jute yarns. Preferably, the above mentioned over laying is effected with the web being caused to change direction, for example through 90°, to cause the over laid fibres in the layers to be at an angle to each other.

1, 9, 10

CLAIMS

1. Non-woven sheet material comprising jute fibres and auxiliary material for imparting strength and rigidity to the sheet material, the auxiliary material having been subjected to heat and pressure so that the auxiliary material binds the jute fibres together and forms the sheet material, and the jute fibres being such that they form the major components of the sheet material.

2. Non-woven sheet material according to claim 1 in which the auxiliary material comprises bi-component synthetic fibres which are formed to have a core of a material suitable for imparting strength and rigidity to the sheet material and a sheath of meltable material which melts such that when it is subjected to heat and pressure, it binds the jute fibres together with the core of material to form the non-woven material.

3. Non-woven sheet material according to claim 2 in which the bi-component synthetic material includes polyester plastics material.

4. Non-woven sheet material according to claim 2 or claim 3 in which the meltable material is randomly dispersed

in the auxiliary material.

5. Non-woven sheet material according to claim 1 in which the auxiliary material comprises plastics fibres.

6. Non-woven sheet material according to claim 5 in which the plastics fibres are polypropylene fibres.

7. Non-woven sheet material according to claim 1 in which the auxiliary material is an adhesive material which has been applied as a powder or as a liquid to the jute fibres.

8. Non-woven sheet material according to claim 7 in which the adhesive material is a polyvinyl acrylic material.

9. Non-woven sheet material according to any one of the preceding claims in which the jute fibres form at least 65% by weight of the non-woven sheet material.

10. Non-woven sheet material according to claim 9 in which the jute fibres form 70-95% by weight of the non-woven sheet material.

11. Non-woven sheet material according to any one of the preceding claims in which the jute fibres are arranged in an even form by using a plurality of carding systems including a fine carding system, and in which the jute fibres are overlaid to achieve a desired thickness and width for the non-woven sheet material.

12. Non-woven sheet material according to any one of the preceding claims and which is provided with reinforcing stitching in the warp direction.

13. Non-woven sheet material according to any one of the preceding claims and which is provided with reinforcing stitching in the weft direction.

14. Non-woven sheet material according to any one of claims 1 to 12 and which is provided with reinforcing weft threads which are laid on the back of a web of the jute fibre.

15. Non-woven sheet material according to claim 14 in which the reinforcing weft threads are positioned between one or more layers of cross laid jute material,

whereby the weft reinforcement becomes hidden between the layers of the cross laid jute material.

16. Non-woven sheet material substantially as herein described with reference to the accompanying drawings.

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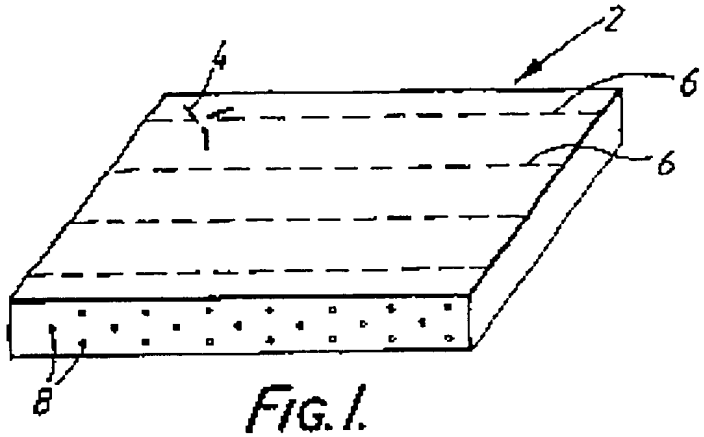

FIG. 1.

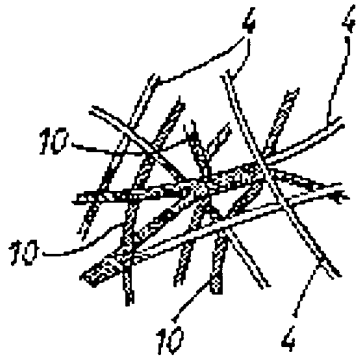

FIG. 2.

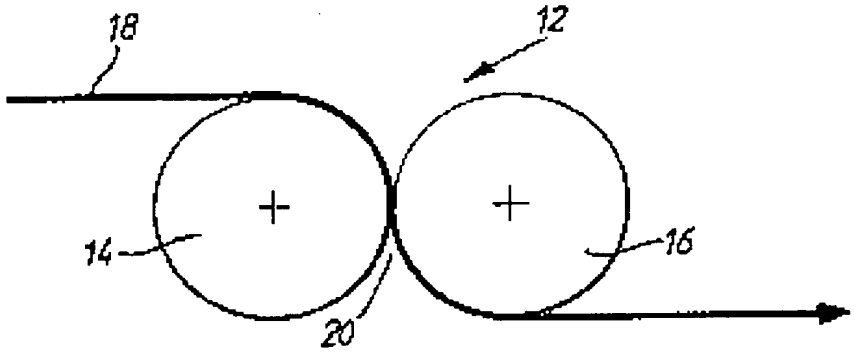

FIG. 3.

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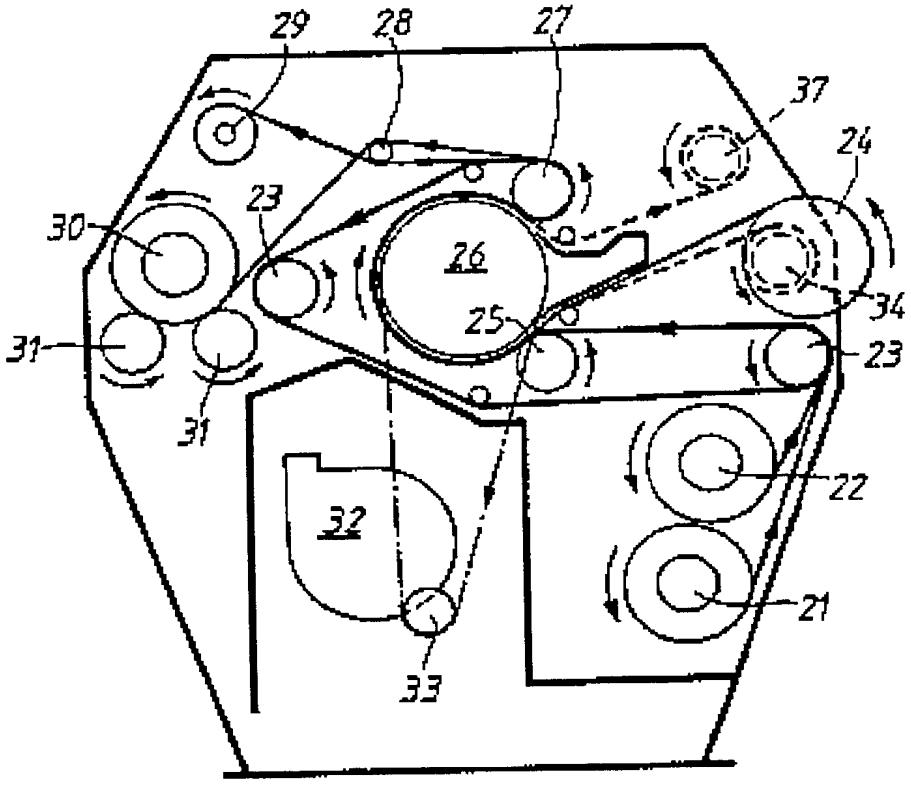

FIG. 4.